

diabetes. Because the volume of data is relatively large and the methods proposed in Chapter II are found to be inadequate for describing survival methods in this population, results are analyzed by life table and relative survival methods within categories of risk. The results and discussion of these analyses are presented in Chapter III.

BIBLIOGRAPHY

- (1) Chiang, C. L.: A stochastic study of the life table and its application, III: the follow up study with consideration of competing risks. *Biometrics*, 17:57-78, 1961.
- (2) Elveback, L.: Actuarial estimation of survivorship in chronic disease. *J. Amer. Statist. Assoc.*, 53:420-440, 1958.
- (3) Cutler, S. J. and F. Ederer: Maximum utilization of the life table methods in analyzing survival. *J. Chron. Dis.*, 8:699-713, 1958.
- (4) Ederer, F., L. M. Axtell and S. J. Cutler: The relative survival rate: A statistical methodology. *Natl. Canc. Inst. Monograph*, 6:101-121, 1961.
- (5) Feigl, P. and M. Zelen: Estimation of exponential survival probabilities with concomitant information. *Biometrics*, 21:826-838, 1965.
- (6) Zippin, C. and P. Armitage: Use of concomitant variables and incomplete survival information in the estimation of an exponential survival pattern. *Biometrics*, 22:665-672, 1966.
- (7) Glasser, M.: Exponential survival curve with covariance. *J. Amer. Statist. Assoc.*, 62:561-568, 1967.
- (8) Mantel, N. and M. Myers: Problems of convergence of maximum likelihood iterative procedures in multiparameter situations. *J. Amer. Statist. Assoc.*, 66:484-491, 1971.
- (9) Drolette, M. E.: Exponential models for survival in chronic disease. Ph. D. dissertation, Harvard University, Cambridge, Massachusetts, 1967.

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CHAPTER III.—SURVIVAL IN A POPULATION OF DIABETIC PATIENTS

1. Maturity onset diabetes (onset occurred after age 40)
2. Massachusetts resident at the time of the first visit to the clinic
3. Positive diagnosis of diabetes made at the Clinic
4. First seen at the Clinic between January 1, 1957 and December 31, 1963.

Information concerning the history of diabetes, as well as information about selected risk factors present at the time of the first visit was abstracted. In addition, the patients were followed through their course of treatment at the Clinic and data on blood sugar, and type, dose and duration of treatment was collected. Since deaths due to cardiovascular causes were most of interest, information on risk factors related to cardiovascular mortality was also collected. Risk factors considered were the following: age at first visit, sex, blood pressure, duration of diabetes prior to first visit, relative weight, history of heart disease, e.g. MI hypertension, ASHD, or rheumatic heart disease, history of kidney disease, cancer, and diseases of the respiratory and/or GI systems, smoking history, and history of early death in the parents. Data on cholesterol levels were not available on enough patients to warrant collecting it.

All patients were followed until death or December 31, 1971 and status as of that date was recorded. For those who died, the date, place and cause of death and, if present, results of autopsy were recorded. The clinic has maintained an updated patient status file so a majority of deaths to this population was already known. However, an extensive effort was made to locate individuals not known to be dead and who were not seen in the clinic after 1970, (persons seen in the clinic and known to be alive in 1970 to 1971 were assumed to have survived until the end of the study.) Three separate mailings went to the patients. If these all went unanswered, additional mailings went to the patient's doctor, family, neighbors and to the town clerk of the city in which the patient last resided. Further follow up was continued by telephone. At the end of the study, 132 of 6291 (2.2%) were untraced.

In an attempt to determine the underlying cause of death, death certificates were examined by a physician without knowledge of which regimen the patient had employed to control his diabetes. Information from the death certificate was obtained either through the town clerk, or, if possible through the state department of vital statistics by mail. Town clerks in cities as large as Boston (where a large proportion of the deaths occurred) were unable to provide the desired data and therefore information for deaths occurring in Boston was ob-